

Axioms and Procedures
for Reconstructions in Comparative Linguistics:
An Experimental Syllabus

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PREFACE

For ten years or so I have felt the need of a procedural introduction to comparative linguistics, cast around a set of axioms and artificial exercises. In the meantime a number of very helpful articles have appeared, written by Bloomfield, Hall, Wonderly, Hoenigswald, Newman and others (see Bibliography), but the volume desired has not appeared. Since others, vastly better prepared for the task than I, have not, so far as I know, written such a book, it seemed that the time had come to begin the collection of materials which might ultimately so serve. In this endeavor Miss Eunice Pike and Miss Sarah Gudschinsky of the phonemics staff of the Summer Institute of Linguistics have joined.

The reader is warned that the materials here are scanty, tentative, and only a shadow of what must ultimately be for adequate results or for even a brief summary of the conclusions reached by a century and a half of scholarly activity in the field.

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Norman, Oklahoma
August 18, 1950

PREFACE TO REVISED EDITION OF 1957

This revision differs from the first edition of 1950 principally by the addition of an appendix designed to point out the suggestions made by Hoenigswald in 1950 (elsewhere, unless indicated explicitly, reference to Hoenigswald is to his article of 1944), and by Hymes in 1955-56. References are also made to articles by Twaddell and Joos.

A number of minor changes and corrections have been worked into the body of the material.

KLP

June 25, 1957

I. General Orientation

Some languages and/or dialects are related. The "family tree" theory suggests that a common ancestor developed differences in sound and grammatical structure, and that careful comparison of existing languages may show that they came from the same source.

Hall illustrates the reason why the branching off of the dialects must not be considered on an equal basis, but that an early branch may develop later branches more closely related to each other than to off-shoots of other main branches. Hall, Proto-Romance, p. 24, fig., A, B.

The neat divisions postulated by this figure of a branching tree are in fact interfered with by borrowings from language to language. Bloomfield, Language pp. 311-314 ^S 10.

Obviously related but different forms are to be considered as developed from a common source unless evidence to the contrary can be adduced. Hall, -Proto Romance, P. 20.

It is assumed that sound change is regular; that each sound of a given dialect will be changed similarly at every occurrence in like circumstances, if it is changed at all. cf. Hall 20, ^S 3a, Hockett p. 125-127 ^S 6, Bloomfield Sound Systems ^S 49, p. 152, footnote 1, p. 130.

The sound in a particular place in a particular morpheme of one dialect, which seems to be a continuation--modified or unmodified phonetically--of an earlier sound in the same place of the same morpheme of a different

dialect, may be called a REFLEX of the earlier parent sound.

Bloomfield Language p. 310

	Tagalog	Javanese	Batak	Primitive Indonesian
lack	'ku:lan	kuran	huran	*kuLan

[l] and [r] are reflexes of *[L]

A set of reflexes of a single parent sound will be called a SET OF CORRESPONDENCES:

Tagalog [l], Javanese [r], and Batak [r] in Bloomfield's example just noted are a set of correspondences.

A set of morphemes from different languages which are derived from a single parent morpheme, is a SET OF COGNATES.

'ku:lan, kuran, and huran cited above are a set of Cognates.

By working with dialects or languages of one period the linguist may set up a series of formulas to indicate the various correspondences noted. A linguistic item so symbolized is a RECONSTRUCTED FORM.

The form *kuLan above is a reconstructed form which symbolizes the following correspondences:

k:k'h; u:u'u; l:r:r; a:a:a; ŋ:ŋ:ŋ

The reconstructed forms, though technically formulas for the correspondences, in many instances indicate with some probability the general phonetic character of forms reconstructed; the more remote in time the reconstructed material is, however, the less its phonetic nature can be assumed.

GRAMMAR, as well as sounds, can be reconstructed. This has been most successfully demonstrated by Bloomfield, Algonquin.

An early stage in the reconstructed history of a language may be called a PROTO-stage; e.g. Proto-Romance, following Hall's usage.

II. Choice of Data

Make a rapid inspection of the dialects and/or languages assumed to be related (or being tested for relationship). Some of these (2 or more) are likely to appear more closely related to each other than to the remaining dialects or languages. Hall, pp.8-9.

For first work, begin by attempting to reconstruct an early stage of two or more of the more closely related ones (Hall, 9); repeat for other closely related groups, and then attempt a reconstruction of the earlier stages.

If possible, make a phonemic analysis of the dialect to be compared. (Wonderly p. 2, Bloomfield Sound System, 132 § 5). If the data are not personally gathered, try to double check their accuracy or consistency; unchecked data must be evaluated in the light of the training, background, and opportunity of the person who gathered it. (Hockett, § 2, p. 121; Bloomfield, Sound System § 1, p. 130; especially Newman, for detailed winnowing of such material).

III. Organization of Data.

In general one lines up words which appear to be groups of cognates for the various languages, by general inspection of the materials. Each cognate set may be placed on a separate slip of paper.

For this purpose, slight differences of meaning from language to language, or slight differences of form, are ignored if the over-all impression received is that they are related. Newman, Central Otomian I p. 4 § 3.1

After choosing closely related dialects, begin work on sounds at some position in the morphemes or words--say word initial. Focus attention on some one sound or sound type--say bilabials. Sort the slips of cognates so as to group together all the morphemes which for one position--e.g. word initial--appear to show the same set of reflexes throughout the various languages. See Wonderly, Some Zoquean Correspondences, for organization.

Utilizing duplicate slips, or columns of data, repeat the process for numerous sound types and various positions of these sounds in the word. Newman, Central Otomian I, p. 3-4.

Make tentative charts of abstracted sets of reflexes in order to be prepared for handling Section III. For detailed illustrations of such chartings, see Bloomfield, Language pp. 300, 301, 310; also Sapir, p. 79.

Another chart by Bloomfield is the following from Sound Systems p. 131.

PCA.	F.	C.	M.	O.
a	a	a	a	a
ā	ä	ä	ä	ä
u	u	u	u	u
ö	ö	ö	ö	ö
e	e	i	e	i
ā	ä	ä	ä	ä
i	i	i	i	i
ē	ī	ī	ē	ī
l	i	i	l	i
ī	ī	ī	ī	ī

IV. First Reconstruction Symbols.

General Goals

Each distinct correspondence must tentatively be reconstructed differently. (Some of these different reconstructions may disappear in Section V).

In general, thus far, we set up tentative reconstruction for any single correspondence which can not be explained by borrowing, etc. Reconstructed sounds or features set up for the parent speech as attested in only one of the dialects, however, must if possible be carefully checked against other data, since they might prove to be new developments in that dialect. Cf. Hall, 18. Further data, or material from additional dialects should either confirm the reconstruction, or provide evidence to the contrary.

A phoneme is not reconstructed in all its occurrences at the same time. Rather it is reconstructed as it occurs initially in the word, then between vowels, morphemes, etc. Wonderly pp. 2-7. (But for a different technique, see the appendix).

Compare Wonderly's examples 1-11 with 12-31, with 44-53 as: *p -(word initial) Proto Zoque *pahk: C. Zoque, N. Zoque, S. Zoque (Tuxtla) W. Zoque, Sierra Popoluca pak; N.E. Zoque (Tapalapa, Ocotopec; San Bartolome, Chapultenango). Mixe pahk bone.

cf. *-p- (intervocals).

Proto Zoque *-p->-p- in CZ, NZ, SZ(Tux), WZ, T, M; >-b- in NEZ; >-p- - -b- in SP.

Proto Z, *kopahk: CZ, NZ, SZ(Tux.), WZ kopak;
M kupahk; NeZ (Tapal, Ocpc., S.Btolo.) kobahk; NeZ
(Chpgo.) kobak; SP ko'bak head (the M. form means skull).

It is helpful to notice that the phonetic differences between correspondences may be similar to the differences between suspect pairs of sounds in phonemic analysis. Correspondences do not have to be phonetically similar, though one should watch for similar components. In Wonderly, p. 5, § 1.3.2 for example, m, n, ŋ are in correspondence with p, t, k, of corresponding point of articulation, as illustrated in examples (40), (41), (42):

[final Cons. compared]

P Zoque	CZ, NZ, Sp, M	Nez (Ocpc. Ppc. SBtolo, Chpgo)	T
Lime *hām	ham	hap	hem
	CZ, NZ, SZ, WZ, M	Nez (all)	T
Pine *cin	cin	cit	ciŋ
	CZ, NZ, SZ(Tux), WZ, SP	Nez (all)	M
Road *tuŋ	tuŋ	tuk	tu'u

Ultimately, one must reconstruct forms that include enough phonemes to account for all that is in the corresponding forms, (and other forms of the same series.) Bloomfield p. 304:

	Old Norse	Old English	Old Frisian	Old Saxon	Old H. German	Primitive Germanic formula
Gothic						
Day [dags]	[dagr]	[deɣ]	[deɣ]	[dag]	[tag]	*['dagaz]

cf. Hall pp. 12-13.

Steps in Procedure.

Reconstruct the parent forms for the more evident correspondences before studying the more difficult ones.

Indicate that a word, part of a word, or sound has been reconstructed (even if it is so attested in one or more of the dialects) by placing an asterisk before it.

If in all the dialects ["dialects" from here on will mean dialects or languages] the sound studied is the same, i.e. if the set of reflexes is identical, reconstruct it as the sound thus attested in the field data, or in other layers of reconstructed data. For example, Primitive Indonesian

*pilik meaning 'choose' is reconstructed from: Tagalog 'pi.li', Javanese pilik, Batak pili. (Bloomfield, Language p. 310); also, same author in Sound System, p. 131 § 4, Primitive Central Algonquian *a is reconstructed from Fox a, Cree a, Menomini a, Ojibwa a. See also Wonderly examples 1-4; Hall 9-12; Bloomfield. Language 301.

If two separate sounds have thus been reconstructed, and in a third set of correspondences both appear, set up a third sound related to both, i.e. with some phonetic component of each, as in Wonderly, pp. 3, 6: (1) P.Zoq. *pahk: CZ, NZ, SZ(Tux.), WZ, SP pak; NeZ (Tapal., Ocpc., Ppc., Chpgo.), M pahk bone.

(44) P.Zoq. *nekn-+*pahk: CZ ne'nbak foot; NZ ne'nbak shin; NeZ (Ppc.) ne'nbahk; NeZ (Tapal.) neknbahk leg.

(8) P.Zoq. *cä': CZ, NZ, NeZ (s.Btolo., Chpgo.), SZ (both), WZ, SP ca'; M ca; T čé stone.

Note in the above examples that: a: a: a is reconstructed as *a; e: e: e is reconstructed *e; a: a: e is reconstructed *ä

If in a set of correspondences, a sound appears which has been reconstructed elsewhere, but one of the reflexes has a different sound, set up a sound which phonetically carries components of each of the reflex sounds or use an arbitrary symbol. Bloomfield, Sound System, p. 131 § 4

PCA	F	C	M	O
*i	i	i	i	i
*l	i	i	l	i

If correspondence between two different sounds is regular, reconstruct as one or the other (distribution, among the dialects, analogy with other correspondences, symmetry of the resultant system, etc. will affect the decision as to which is to be used for the reconstruction).
Wonderly p. 5 example (31): Proto-Zoque *k^w > -kw- in Zoque dialects and Sierra Popoluca;

>-p- in Tapachulteca.

Proto Zoque	Central Zoque	N.E. Zoque (Tapal. Ocpa.)	Sierra Popoluca
*kähk ^w e-:	kakwe;	kahkwe;	kakwi;
Tapachulteca	Mixe		
kepén;	ka'py	<u>scorpion</u>	

Cf. Also Bloomfield, Language 307 Greek p, Germanic f.

If a phoneme of one dialect corresponds with more than one phoneme of the other dialects, reconstruct a different form for each correspondence: Bloomfield, Language 306

a:a	*a	Those are reconstructions made for Primitive Indo-European.
a:o	*o	
i:a	*e	

Wonderly - p. 2 b.

Proto Zoque *kāmäck) : CZ, NZ, Nez (Tapalapa, Ocotepec, Pantepec), SZ (Tuxtla), S P kama; Mixe kam; Tapachulteca kémek cornfield (The Mixe form means land).

Bloomfield, Sound System p. 131 § 4

Proto Central Algonquian	Fox	Cree	Menomini	Ojibway
*i	i	i	i	i
*l	i	i	l	i
*e	e	i	e	i

or: Set up a diversity rather than uniformity: If in some dialects a sound contrast occurs which other dialects do not have, then that contrast may have existed in the proto form. Wonderly page 8 § 2.3 Also examples (42), (43).

If in a series of correspondence some dialects have variant reflexes in some words only, the reconstructed form need not be changed if the variants can be phonologically described. The conclusion and data should be preserved for the technical description of the material, however. For phonological processes see Buck, 36-39; Nida, 21-36, 283-312; See also Bloomfield, 304 § 3.

See also Wonderly - p. 3, example (6):

*c - č - before *i in Popoluca and before *i, *ä in Tapachulteca. Proto-Zoque *cuhk: C Zoque, S Z. (Tuxtla), S P, Tapachulteca, Mixe cuk; NeZoque (Tapalapa, Ocotepec) cuhk mouse.

cf. Wonderly p. 3 (7) P.Zoq. *cin: CZ, NZ, SZ (Tux.), WZ, M cin; NeZ (Ocpc., S.Btolo., Chpgo.) cit. T čin pine, SP čin̄kuy pine tree.

Although a present environment may not explain the alternation, the preceding axiom still applies if a reconstructed difference in environment explains it.

Bloomfield, Sound System, pp. 133 § 11, p. 134 § 13.

See Bloomfield, Language, pp. 308-9 for an extensive discussion of steps in reconstruction of primitive Indo-European. *bhra:te:r brother and *pe'te:r father.

Reconstruct not only single consonants and vowels but vowel and consonant sequences. Cf. Bloomfield, Sound Systems, especially p. 147.

Check for symmetry in consonant sequences. If there is one cluster of stop plus nasal, check to see if all the stops appear with the nasals. If s plus nasal is found, and s plus stop, check for s plus stop plus nasal.

Check for holes in the pattern and consonant cluster symmetry. Check for symmetry among the reconstructed single correspondences. If there are tag ends which are out of proportion, check to see if these single consonants could be re --analyzed, as consonant clusters.

If a consonant cluster appears in one dialect, and one member or the other occurs in other dialects, reconstruct the cluster, and postulate the loss of one member in the other dialects. Wonderly p. 8 example (61):
P. Zoq. *mohk: CZ, NZ, SZ(both), WZ, SP, M mok; T mak;
NeZ (all) mohk maize. i.e. If in a set of correspondences one of the reflexes is zero, assume the reconstructed form required by the other reflexes and postulate its loss for the dialect containing zero, as:

Ixcatec
kahu,

Mazatec
kao,

Proto Popolocan
*kahu

It is easier "to recover conditioned merger of phonemes from the existing state of the language provided that such merger...involved some morphology". "If it did not, the

only trace might be a peculiar gap in the list of phoneme clusters." Hoenigswald, "Internal Reconstruction" page 81; Cf. knowledge ~ acknowledge in which the k is lost between pause and n. But cf. Old English hnecca 'neck' and hring. The only present clue to the loss of the /h/ is the gap in the distribution of present day h.

If in corresponding clusters, one member is identical in all its reflexes with a form already reconstructed, but the other member has different or conflicting reflexes when compared with forms already set up, use an arbitrary symbol for the divergent member. (In this case the reconstructed phoneme probably is not actually a phoneme of the proto language but reflects allophonic changes caused by the contiguous phoneme).

See the following reconstruction from Bloomfield quoted in Sapir p. 77 Table III. The p follows the same correspondences as elsewhere in the reconstruction but the first members of the clusters are divergent:

Sapir p. 77 Table III.

	PCA	Fox	Ojibway	Plains Cree	Menomini
1.	tcp	ʔ	hp	ʔ	tsp
2.	cp	hp	cp	sp	sp
3.	xp	hp	hp	sp	hp
4.	hp	hp	hp	hp	hp
5.	mp	p	mb	hp	hp

Note the very famous example of Bloomfield's in which such a reconstruction was set up on the basis of a single correspondence, and later confirmed by additional data.

Bloomfield, Sound System p. 153 § 49. See Sapir's comment p. 76-78, also Hockett p. 125 section 6.

Aids other than sound correspondences

Probabilities:

Be suspicious of sounds of types known to result in various languages from phonological processes, and where choice must be made, choose if possible to reconstruct the type less likely to be the result of such a process of change. Cf. Buck, 36-39. Nida, 21-36, 283-312.

If some dialects have voiceless stops between vowels, and some have voiced stops between vowels, the voiceless stop is chosen for the proto form, if other considerations do not decide the issue.

Wonderly: page 3b example (13): P Zoq * -p->-p- in CZ, NZ, SZ, WZ, T, M; > -b- in NeZ; > -p- ~ -b- in SP.
(13) P Zoq *popo: CZ, NZ, SZ (Tux.), WZ popo;
NeZ (Tapal. Ocpc, Ppc, Chpgo.) pobo; SP po'po white.

Wonderly page 4 example (17):
P Zoq * -t->-t- in CZ, NZ, SZ, WZ, T; > -d- (~-t-) in NeZ (Tapal., Ocpc., Ppa.); > -r- (~-t-) in NeZ (Chpgo); > -t- (-t^y before i) in SP.
P Zoq * witAm (?): CZ, NZ, SZ (Tux.), WZ witAm; NeZ (Tapal, Ocpc.) widAm; NeZ (Ppc.) widAp; NeZ (Chpgo.) wirAn eye.

If preceding the vowel i, some dialects have an alveolar sound, and some have an alveo-palatal sound, the alveolar sound is chosen for the proto form.

Wonderly, p.3, example (7): *c->č- before *i in Popoluca and before *i, *ä in Tapachulteca. Before *i: P Zoq *cin: CZ, NZ, SZ (Tux), WZ, M cin; NeZ (Ocpo. SBtolo., Chpgo.) cit; T čin pine. SP čin kuy pine tree. See also examples (23), (20), (72).

If some dialects have voiceless stops after nasals, and some have voiced stops after nasals, the voiceless stops are chosen for the proto form.

Wonderly: p. 6, example (45): P Zoq *min- +*-pa: WZ minpa; SP miñpa; CZ, NZ minba he comes.

Assume simplest morphological form where it does not distort the data: Omit from the reconstructed form phonemes that are not a part of the morpheme under consideration. (such as infixes, etc.) Wonderly, p. 4 footnote 3.

Internal Reconstruction. Reconstruct where possible, the older form of each dialect, where morphophonemic processes indicate the recent development of allophones to phonemes, or other changes. See Wonderly, p. 2, Hockett p. 123 § 4 (discussing Bloomfield), and Hoenigswald.

If a phonemic series has a limited distribution, (for example, if the stops do not appear word final) it may be because in the proto language that series were allophones only. Because of some conditioning in the proto language, the other allophones of the phonemic series were lost. cf. Hoenigswald, "Internal Reconstruction" page 80; also Hall, page 13.

Similarly one hint that two or more phonemes in the proto language united into one in the daughter language is the "lack of balance in the statistics of the overall phonemic occurrence." That is, one vowel phoneme in the daughter language may occur much more frequently than the other vowel phonemes. See Hoenigswald, "Internal Reconstruction" page 81.

On the other hand, limited distribution of two phonemes, phonetically similar, indicates that in the proto language they were allophones. Hoenigswald, "Internal Reconstruction," SIL 2.4 pp. 79-80.

Nonproductive forms are more likely to be the older layer and more like the proto language than productive forms which may be analogies. Then correspondences in the nonproductive forms of two separated languages give a check on reconstructed forms. Bloomfield, Language, - pp. 308-309 (on stress).

The daughter language may have more phonemic contrasts than the proto language because of loan words which have been introduced. Hoenigswald cites English as an example. He says that *f* and *v* used to be allophones, and that they became phonemic at the introduction of loans. Limited distribution is the key to this problem. Notice that some phonemes occur for the most part in loan words. Hoenigswald, "Internal Reconstruction" page 82.

Suppletive, but phonemically similar and contrastive forms in a paradigm may be a hint that a phonemic contrast exists in the daughter language that did not exist in the proto language. Supposedly the paradigm was regular

in the proto language, but two allophones were used. The factor determining the use of the allophones was lost, and the phonemic contrast arose. Hoenigswald, in "Internal Reconstruction", page 83, cites as an example English 'wreath' ~ 'wreathe'. The /θ/ and /ð/ were originally two allophones of one phoneme; /θ/ was in order before pause, /ð/ before a vowel, which was subsequently lost.

Residues or apparent exceptions may be due to dialect borrowings or other factors.

Wonderly p. 3: "In NeZ, the stops *-p- *-t- become -b-, -d- (-r in Chapultenango) in most words. There may be a residue of apparent exceptions which may be due to dialect borrowing." Examine residual materials for possible borrowing from related dialects, other languages, or by analogy within the dialect.

Residues may be due to later changes, to an intermediate parent language. Bloomfield, Language page 304 (3) "In fact the English [ɛ] and the Frisian [e] occur under fixed phonetic conditions," etc.

Losses or dialectal spread of phoneme substitution may affect some words but not all the words in a dialect: Wonderly p. 8a example (61): P Zoq * mohk; CZ, NZ, SZ (both) WZ, SP, M mok; T mak; NeZ (all) mohk maize. See also examples (62) - (69). In map IV, Wonderly shows one main isogloss marking the entire area having loss of *h in all or some words and two counter isoglosses or resisting isoglosses which mark areas where loss of *h is limited to certain words. One may thus postulate one center of innovation for the phenomenon, with two areas where the phenomenon has not been carried to completion.

By morphological analogy certain types of forms may be extended to forms where historically they would not have been expected. If an irregularity occurs in inflection, check to see if a hypothesis can be suggested and substantiated which would account for the irregularity of correspondence on the basis of morphological analogy. See Buck p. 45 and also p. 182 § 240.1 and p. 129 § 154.

Check irregularities, also, (or correspondences which are illustrated by few morphemes only) to see if they may constitute a layer, early or late of borrowings from other dialects of the same language or from related or unrelated languages; such borrowings tend to be affected by any further changes in the sound pattern of the language, but not to be historically linked with the earlier stages by regular sound correspondences. See Buck p. 17 § 18.

Within the reconstructed materials, watch for morphophonemic changes between two or more occurrences of the same morpheme. In the following morphophonemic comparison, the voicing of stops after nasals in some dialects is illustrated.

Wonderly: p. 6 § 2.1: In SP and WZ, stops remain voiceless after nasals. In CZ, NZ, NeZ, stops are voiced after nasals. In M stops are voiced after nasals except when the cluster is word final. p. 7 example 51: P Zoq*ʔan- + *kopahk: CZ, NZ ŋgopak; NeZ (Ocpc.etc). ŋgobahk; SP ʔaŋkoʔbak; T angopik my head.

In these illustrations, there is assimilation of

the nasals to the point of articulation of the following stop.

Wonderly, p. 7. cf. examples (52) and (53): (52) P Zoq *maŋ- + *-kuy: WZ maŋkuy foot (going instrument); CZ manguy (act of going). (53) P Zcɔ *ʔan- + *kaŋ SPʔaŋkaŋ; CZ ŋgaŋ; ɐ ŋga my jaguar.

If, when the work is carried as far as possible, a small residue exists, consider the following possibility: A seeming hopeless tangle in the dialects may be due to the fact that there was alternate pronunciations of the proto form. See Wonderly, p. 6 example 49. If "within the parent language there was some dialectual difference: this dialectual difference will be reflected as an irreconcilable difference in the related language."

Bloomfield, Language 314-315 with example.

Watch, too, for centers of innovation and incomplete spread of a form. See Wonderly p. 3, the examples for intervocalic *-p- and page 8 § 2:3.

V Re-phonemicization. Make a phonemic analysis of the reconstructed language.

Rewrite the formulas phonemically in accordance with that analysis. Hall, p. 12 ff.

"In reconstructing the phonemic pattern of a parent language, one should try to arrive at a set of phonemes bearing a relation to each other of the kind that is known to exist in languages more directly observed." (Hockett, page 128.)

"It goes without saying that comparative reconstruction must be accompanied by descriptive reanalysis at every stage. If this is not done, we run the risk of needlessly multiplying the non-essential features we set up for each stage of our reconstruction." (Hall, page 22.)

No a-priori assumption can be made as to the simplicity or complexity of the language being reconstructed, (Hockett, p. 124, § -5) but the result should be within the limits of the kinds of things known to occur within documented language material (regarding living languages or written documents).

Check the validity of the reconstruction by comparison with other languages, recorded or reconstructed of the same period and family. (Bloomfield, Language p. 300-302, § 18.4). Label the stage, by "proto" + geographical or other name.

VI. Expanding Reconstructions. Then reconstruct further, by comparing this reconstruction with other reconstructions of different sets of groups similarly treated, in order to arrive at an earlier stage. Then: label the stage of reconstruction; re-phonemicize; repeat procedures with materials still more different. i.e. Repeat earlier steps, in reconstructing the next earlier level of the language family under consideration. (Hall, p.16. Bloomfield, Language p. 306-309, § 18.7).

VII. Descriptive Techniques for Writing up Materials. Assemble the data analyzed, in a form suited to the technical audience.

Include the sets of cognates, for their checking.

If the cognates are to be referred to in various places in the presentation, number them so they can be referred to by number and need not be re-printed at each reference. (Wonderly, especially top of p. 6).

If space permits, give charts of the sets of reflexes, both of single and clustered, for ready reader reference. (Bloomfield, Sound-System, passim). If space is at a premium, give only the crucial set(s), or handle them in some other way.

List the reflexes, in various phonological and grammatical environments, and illustrate them with sets of cognates. (Wonderly, p. 3 and 4).

P. 3. *k- (word initial): (9) PZoq *kuy: CZ, NZ, NeZ (Tapal., Ocpc., SBtolo., Chpgo.), SZ (both), WZ, SP, T kuy tree; M kuyhyam wood ashes. (10) PZoq *kA?: CZ, NZ, NeZ (Ocpc., Ppc., SBtolo., Chpgo.), SZ (Tux.), SP kA?; M kA?Z hand; WZ kAcuř finger (?) (cf. SP kA?cus finger).
P. 4. *-k- (intervocalic): PZoq *-k-> -k- in CZ, NZ, SZ, WZ, NeZ, T; > -k- ~-g- in SP, M (?) (the alternation is unexplained). (27) PZoq *hoko: CZ, SZ (Tux.), NeZ (Ocpc.) hoko; SP ho'ko; M hok smoke. (28) PZoq *cokoy: CZ, NZ, SZ (Tux.), NeZ (Tapal., Ocpc., Ppc.) cokoy heart; SP co'goy liver.

Sometimes maps of dialects and features of dialects are a convenience. (Wonderly, p. 1, 6, 7, 8, 9).

Lists or charts of the phonemes of the various stages are also sometimes helpful. (Wonderly, p. 2; Hall, p. 15 and 18).

VIII. Artificial Exercises for Solving

1. Which two of the dialects are the most closely related?

	A	B	C
dress	spine	pslę (cloth)	pine
girl	saho	saoso	saho
dog	keta	ketaso	keda
sun	hinun	hıq	hinu
fly	stumis	tsomi	tumis
cloud	hihe	hie	hihe
house	mopaf	mopa	mobaf
road	ketą	ketą	keda

2. Set up a chart abstracting the sets of word initial reflexes.

A	B
pota	fota
kimbo	ximbo
talo	θalo
nita	niθa
bega	θega
pazi	paži
tohva	tofa

3. Make a chart abstracting the sets of word final reflexes.

A	B
limep	dimef
nazok	nazox
zohzit	zosiθ
gilan	gilą
tifob	θifob
nata	naθat

4. What are the reflexes in B of the clusters with /h/ ?

Proto-B	B
*pohmo	pqxq
*tozha	tosa
*zivna	zivna
*nogha	noxa
*lozmi	lozmi
*mavho	mafo
*tohpi	topi

5. Set up the reconstructed forms of word-initial phonemes and state the axiom used for their choice.

Reconstructed form of word-initial phonemes	A	B
	fito	petu
	sola	sora
	t ^l emi	tem
	xosa	kasi
	k ^l izo	kisa
	mbar	nbar
	ngib	ngib
	θo	to

6. Reconstruct the intervocalic stops:

A	B	C
mabo	lapo	mapu
bipo	bibo	bipu
stopi	tsopi	topi

7. Reconstruct proto forms for the vowel of the following and give reasons for each reconstruction.

	A	B	C
tree	sal	sal	šal
cow	pam	pem	pah
pig	gep	gap	kap
boat	tas	tas	tas
water	reg	rag	lak
shy	sar	ser	šal

8. Set up proto forms for word medial consonants.

	A	B	C
dry	kišihi	kiši	kišihi
horse	kuši	kaši	kuši
he whistles	baše	base	baše
water jug	čiša	čisa	čiša

9. Reconstruct the consonant clusters. How would you describe the correspondences?

A	B	C
ʔm	m	ʔ
sn	n	s
ʔb	p	ʔ
sp	p	s

10. Set up the proto forms.

	A	B	C
plant	šika	ška	ka
eye	šiku	šku	šku
boat	šikanu	škanu	kanu

11. Set up the proto form for word medial consonant. Indicate what goes in a residue and why.

A	B	C
čakų	čakq	čakq
ška	ška	ška
paką	paką	baką
pačo	pako	pačo
tika	tiča	tiča

12. Set up the full proto forms.

A	B
kahu	kao
piho	pio
nihe	nię
tehe	te

13. Set up reconstruction of word medial consonant or cluster.

A	B	C
niña	niña	niya
niñu	niq	niyu
niñu	niño	ninyu
niña	nią	niya
čiña	čia	čina

In some instances the initial tentative reconstructions are made directly in a manner analogous to phonemic procedure. In these instances the symbol for a set of correspondences is assumed to represent or be a reflex of an allophone of a phoneme (or to be the reflex of an allophonic manifestation of a phoneme cluster). This implies that one studies the initial correspondences to see whether those sets of correspondences which have sounds in common (and hence are "phonetically similar") are also complementarily distributed in reference to some observable or reconstructed conditioning factor or factors. If they are, it is then assumed that these items must be reconstructed as respective allophones of a single phoneme (or as sequence of the allophones of the phonemes in a phoneme cluster).

Note that Hoenigswald (1950) treats this as the primary step in the reconstruction process, and states (p. 359) that 'Partially like sets occurring in mutually exclusive environments are taken to be continuations of one and the same phoneme of the proto-language.'

For example he has listed the following sets of correspondences (p. 358) as similar enough to warrant study from this point of view since each Sanskrit-Germanic set contains at least one sound in common with one or more of the other sets with which they should be compared.

1 2 3 4 5 6 7 8 9 10 11 12

Sanskrit: t t t d d dh p p p b b bh

Germanic: t d p d t d p b f b p b

'Examples: 1 ásti : ist 'is'; 2 pitár- : fadar 'father'; 3 bhrátar- : broþar 'brother'; 4 dehí- 'wall' : deigan 'knead'; 5 véda : wait 'I know'; 6 mádhyā- : midjīs 'middle'; 7 spác- 'watcher' : OHG spehōn 'look out'; 8 lip- '(stick) smear' : bi-leiban '(stick,) stay'; 9 see 2; 10 bódhati 'awakes, is attentive' : ana-biudan 'charge with, bid'; 11 rāmbate 'hangs down' : MG lampen 'droop'; 12 see 3.'

Of these, set 2 occurs 'after Skt. unaccented vowel and Gmc. vowel, 3 after Skt. accented vowel and Gmc. vowel or after pause in both languages, but not conversely' so that they are reflexes of the same phoneme.

On the other hand pairs of phonetically-related sets of correspondences might prove to be in contrast in the observed or reconstructed material. If so, they are set up as separate phonemes. Thus, for example, the Sanskrit-Germanic sets 3 and 9 contrast with each other since 'both, say, occur after pause and before r, as in tráyas: preis 'three', pra- 'fore' : fra- prefix.'

Note that this is not contradictory to the procedures mentioned earlier but differs in that it implies an application of phonemic procedures at an earlier stage in the process. For this reason it can on occasion save some awkwardness in arriving at the goal which either approach might eventually have been expected to reach.

It is useful to show the relationship between the reconstructed parent phonemes and the phonemes in one of the daughter languages, in reference to the pattern of the two systems involved. This can be done by a chart which lists the reconstructed phonemes at the top of the respective columns (with certain columns subdivided according to relevant environments) and the daughter phonemes in a column at the right. At the intersecting junctions of the rows and columns the particular daughter phoneme is indicated in that column or subcolumn which indicates the conditions under which it developed from the parent source. Note the following chart adapted from Hoenigswald (1948 p. 91).

p [Environments] s(); \check{V} (); other	b	bh	GERMANIC
p > p			s() other } p
	b > p		
p > b		bh > b	b
p > f			f

The reconstructed Indo-European phonemes are p (in environments after s, after short vowels, and elsewhere), b, and bh. The Germanic phonemes are p (in environments after s, and elsewhere), b, and f.

For other kinds of charts see Hoenigswald (1948, 1950).

When there is ambiguity such that one set of correspondences is in complementary distribution with each of two other sets which contrast with each other, that set is combined with the one of the other sets which leads to the greatest over-all economy in the postulated phonemic system of the reconstructed language. If by one decision an extra phoneme is demanded, whereas by a different decision no new phoneme (but only additional clusters) must be reconstructed, the economy of the latter decision is in its favor, especially if it results in a more complete or regular distribution for the phonemes postulated. (Hoenigswald 1950 p.360-61).

Such decisions can be supplemented (especially where the sounds in question are not phonetically similar) or modified by internal reconstruction based upon morphophonemic evidence, or by considerations of phonetic plausibility, or by data from other languages than the ones originally consulted (Hoenigswald 1950 p. 361-3).

Compare Twaddell 1938 and 1948 for illustrations of the relationship of sound change to allophonic characteristics.

For the kind of presentation of reconstructed system which begins the argumentation from the reconstructed forms rather than working backward from the more recent data to those forms, see Twaddell (1948). He also there illustrates complications due to dialect borrowing and other complicating factors.

For an illustration of the intricate character of the phonetic evidence in any one instance, one may consult Joos (1952).

Not all evidence is to be equally weighted in reaching decisions in a delicate problem. 'Thus, in discarding analogical new formations one follows, roughly, a hierarchy of trustworthiness in which phonemes in morphologically isolated forms come first; then phonemes in paradigms where they alternate with other phonemes (because many alternations result from conditioned sound change); and finally phonemes in regular paradigms (because the regularity may be due to leveling).' Hoenigswald (1950 p. 357).

Similarly 'to guard against the effects of secondary

developments in daughter languages, we may refer to Meillet's rule that in reconstructing the vocabulary of a proto-language we need the testimony of three, rather than two, independent witnesses. For many other purposes, however, reconstruction from more than two witnesses may well be viewed as a mere extension of the fundamental operation involving only two.' Hoenigswald (1950 p. 357-58).

Since 1891 there has been a controversy among comparativists as to the validity of using morphological resemblances between languages as an evidence of genetic relationship, in the absence of data such as to permit the phonological reconstruction of the morphemes involved. Hymes (1955, 1956) has recently elaborated a procedure for extending the basic principles of phonological reconstruction to the reconstruction of sequences of morphological categories. He bases his materials on the two criteria which Bloomfield considered basic to the comparative method proper: common occurrence, and systematic relationship. This new approach is useful for providing evidence of relationship at remote time depths for which cognate lexical items are exceedingly scarce. It also supplements the phonological reconstruction of specific morphemes, and the reconstruction of grammatical pattern seen as a result of -- or in connection with -- morphemic reconstruction, by the reconstruction of grammemes or allograms even when their specific manifesting morphs are not reconstructable.

It appears to me that a useful parallelism can be seen between the techniques of reconstructing phonemes and grammemes. In developing formulas for the certain presence of a phoneme or allophone, there is no certainty as to the historical phonetic manifestation of that phonemic unit. Similarly, in developing formulas for the certain presence of a grammeme or allogram there may be no certain knowledge of the historical morphetic manifestation of that grammemic unit or system of units; the membership of the class may be uncertain even when the presence of the class may be certain or highly probable.

The form-meaning criteria required for routine identification of cognates is met here not on a morphemic level but on a level of 'positional categories'. In this instance 'the requirement of similarity in form is met by the sequential relationships of morpheme classes within words rather than by the sequential relationships of phonemes within morphemes; the requirement of similarity in content [i.e. meaning] is met by the semantic resemblance of relative-order positions as wholes rather than by the semantic resemblance of individual morphemes', Hymes (1956, p. 627). Thus if more than three positional categories such as tense, aspect, mode, pronoun, plurality, etc., can each be found within the verb of the respective languages, and these four or more are in the same order relative to each other, the general theoretical requirement of similarity in form and meaning is met by similarity of categorical type plus similarity of positional form. 'This

focus on positional order may take on new significance in the light of the approach being developed by Kenneth Pike (1954), which introduces the concept of the grameme* as a unit, beside that of phoneme and morpheme, dealing with matters of distribution and order' Hymes (1956, p. 635). I would now add that grammemes within the morphological verb complex (or elsewhere, for that matter) need to be treated rigorously within particular word and sentence structural types rather than in terms of generalized positions for all verb types of a language as a whole. The theoretical necessity for this refinement of morphological description, can be seen applied in the articles of Pike, Cox, and others, to appear in the July, 1957, issue of the International Journal of American Linguistics; the basic grammemic theory itself is bound in Pike's Language in Relation to a Unified Theory of the Structure of Human Behavior, Part I, (Glendale, Calif.: Summer Institute of Linguistics, 1954).

*Note that Hymes uses the spelling grameme. Since the publication of Parts I and II of Language, I have adopted the spelling grammeme.

X. Bibliography of Comparative Materials mentioned in Text.

- Bloomfield, Leonard. "Algonquian," Linguistic Structures of Native America, 85-129, (Viking Fund Publications in Anthropology, No. 6.) New York: the Viking Fund, Inc., 1946.
- . Language. New York: Henry Holt and Company, 1933.
- . "On the Sound-System of Central Algonquian," Language, I (1925), 130-56.
- Buck, Carl Darling. Comparative Grammar of Greek and Latin. Chicago: University of Chicago Press, 1933.
- Hall, Jr., Robert A. "The Reconstruction of Proto-Romance," Language, XXVI (January, 1950), 6-27.
- Hockett, Charles F. "Implications of Bloomfield's Algonquian Studies," Language, XXIV (January, 1948), 117-31.
- Hoenigswald, H.M. "Internal Reconstruction," Studies in Linguistics, II (1944), 78-87.
- . "The Principal Step in Comparative Grammar," Language XXVI (July, 1950), 357-64.
- Hymes, D.H. "Positional Analysis of Categories: A Frame for Reconstruction," Word, XI (1955), 10-23.
- . "Na-Dené and Positional Analysis of Categories," American Anthropologist, LVIII (August, 1956), 624-38.
- Joos, Martin. "The Medieval Sibilants," Language, XXVIII (April, 1952), 222-31. Reprinted in Joos, Martin, ed. Readings in Linguistics. Washington: American Council of Learned Societies, 1957, pp. 372-78.
- Newman, Stanley, and Weitlaner, Robert. "Central Otomian I: Proto-Otomi Reconstructions," International Journal of American Linguistics, XVI (January, 1950), 1-19; "Central Otomian II: Primitive Central Otomian Reconstructions," IJAL, XVI (April, 1950), 73-81.
- Nida, Eugene A. Morphology: The Descriptive Analysis of Words. Ann Arbor: University of Michigan Press, 1949, pp. xvi-342.
- Pedersen, Holger. Translated by John Webster Spargo. Linguistic Science in the Nineteenth Century: Methods and Results. Cambridge: Harvard University Press, 1931, pp. x-360.
- Sapir, Edward. Selected Writings of, in Language, Culture, and Personality. Berkeley and Los Angeles: University of California Press, 1949. Edited by David G. Mandelbaum, pp. xv-617.

Swadesh, Morris. "The Phonemic Structure of Proto-Zapotec," International Journal of American Linguistics, XIII (Oct. 1947), 220-30.

Twaddell, W. Freeman. "A Note on Old High German Umlaut," Monatshefte für deutschen Unterricht, XXX (1938), 177-81.
Reprinted in Joos, Martin, ed. Readings in Linguistics.
Washington: American Council of Learned Societies, 1957,
pp. 85-87.

Wonderly, William L. "Some Zoquean Phonemic and Morphophonemic Correspondences," International Journal of American Linguistics, XV (January, 1949), 1-11.